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DEPARTMENT OF COMMERCE

BUREAU OF STANDARDS

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GENERAL NOTE

Owing to the current nature of the investigations mentioned in the Technical News Bulletin, sometimes it will be impossible to supply printed information regarding them. However, in these cases, when the investigation has progressed sufficiently far, the Bureau will be pleased to furnish technical data to those engaged in the particular application of the subject, in order to avoid the delay incident to publication.

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1 Production of Liquid Air

Information on the construction and operation of liquid air plants is meager, and, therefore, the publication of Scientific Paper No. 419 of the Bureau of Standards entitled "The Laboratory Production of Liquid Air" should be of considerable interest. It may be obtained from the office of the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5¢ per copy.

The paper describes the plant for liquefying air by the Hampson process as installed at the Bureau. A 4-stage steam-driven compressor delivers air at room temperature and under pressure of approximately 3000 lb. per sq. in.; this air then passes through an oil and water trap and a purifying train containing reagents which remove the carbon dioxide and water vapor. The air thus compressed and purified is delivered to the liquefier, in which after passing through a coil of copper tubing, the air is allowed to expand freely to approximately atmospheric pressure. Where this drop in pressure takes place, there is a corresponding drop in the temperature of the air. The expanded air befpre leaving the liquefier circulates around the copper coil which

contains the compressed air, thus cooling the same so that on continuous operation a cycle of progressive cooling is maintained until the temperature ultimately reaches the liquefying point. The liquefier is so constructed that the air which is condensed to liquid is delivered into a receiving vessel. The gaseous air exhausted from the liquefier is returned to the intake of the compressor for succeeding cycles because it has been purified and when used repeatedly will be less exhausting on the purifying agents.

2 The Specific Volume of Liquid Ammonia

Scientific Paper No. 420 of the Bureau of Standards, now for sale by the Superintendent of Documents at 5¢ per copy, consists of a detailed description of laboratory measurements with very high precision over a considerable temperature range of the specific volume of pure anhydrous liquid ammonia under the pressure of saturation at each temperature. This is one of the series of measurements of the physical properties of pure ammonia in progress at the Bureau of Standards for the purpose of compiling a standard ammonia table for use by the refrigeration industry. The method employed is described, and as a result of the work an empirical equation has been found which represents closely the results in the temperature range covered experimentally and also conforms to what is known about the behavior of liquids at the critical temperature.

3 Corrosion of Underground Pipes

In certain sections a very serious condition exists in connection with underground pipe systems, owing to the corrosive action of the soil upon the iron of which the pipe is made. The loss from this cause is so large that the Bureau of Standards has recently undertaken an extensive investigation of the subject with particular reference to the corrosive action of soils on gas and water mains.

In this investigation, the Bureau has the cooperation of the Bureau of Soils of the Department of Agriculture, the pipe manufacturers, and the public utility companies through the Research Subcommittee of the American Committee on Electrolysis. Forty locations have been selected representing the different kinds of soils to be found throughout the United States and at each locality a number of samples of every kind of iron and steel pipe in commercial use will be buried. Some of these samples will be uncovered from time to time to determine the rate of corrosion. Complete data on the physical and chemical properties of the soil and the

pipes will be obtained and extensive laboratory experiments will be conducted to determine the effects of variations and individual characteristics of both soils and pipe materials. Some tests of representative pipe coatings will also be undertaken.

The results of the tests should be of great value in determining the importance of soil corrosion and in selecting the kind of pipe best suited for use in any particular soil. It is expected that considerable data as to the relative rates of corrosion of the different kinds of pipe in the soils under observation will be obtained within 2 or 3 years but the investigation will probably continue over a period of 8 or 10 years. Progress reports will be published from time to time as developments warrant.

4 Conference with American Electroplaters' Society

Arrangements have been made for a conference in Washington in the near future with an advisory committee representing the American Electroplaters' Society. It is planned to hold such conferences about twice a year in order to afford an opportunity for suggestions or criticisms regarding the work and plans of the Bureau upon electrodeposition and the application of the results in commercial practice.

It is interesting to note in this connection that during the months requests for information or [illegible] assistance upon electrodeposition were received from five different branches of the government service, namely, the Bureau of Engraving and Printing, the Hydrographic Office, the Coast and Geodetic Survey, the Quartermaster Corps of the War Department, and the Government Printing Office. In each case some assistance was rendered and arrangements made for further cooperation.

5 Metallurgical Examination of a Broken Crankshaft

A broken crankshaft from a 10-ton ammonia refrigeration machine was submitted for examination by one of the other government departments. The material proved to be inferior in that it was decidedly porous and showed evidence of not having received sufficient reduction in forging. The break which occurred was in the nature of a fatigue failure and had its origin in the angle between one of the throws and the bearing. A defect at this point had been filled in previously with arc-fused metal. Such a procedure would not necessarily lead to failure had the defect been located elsewhere, but at the point in question the stresses are much higher than at other points on the shaft, and the break once started would be propagated rapidly owing to the unsound character of the steel.

6 Results of a Survey of Elevator Interlocks and an Analysis of Elevator Accident Statistics

In connection with the preparation of the Elevator Safety Code, which work was carried out in cooperation with the American Society of Mechanical Engineers, the Bureau of Standards has prepared Technologic Paper No. 202, price 5¢ from the Superintendent of Documents, giving results of a field survey of several thousand elevator landings equipped with various types of mechanical and electro-mechanical interlocks and contact devices.

In this paper elevators are classified into three groups: Class A, elevators located in buildings in which the service is heavy, and where maintenance service is provided; Class B, buildings in which service is heavy, but in which no maintenance service is provided, and Class C, buildings in which no maintenance service is provided.

The data, which were secured in various parts of three states and a number of large cities, are classified under the above grouping, the performance in each grouping being briefly discussed. The difference between an electro-mechanical interlock and a contact device is clearly pointed out, and the functions and usual method of operation of each type of device are given. The comparison of the advantages and disadvantages of service of each of the three types are given in tabular form, and some suggations as to possible improvements are added.

Representative statistics of elevator accidents are given: Group 1, accidents from the entire United States, reported by the public press through clipping bureaus; Group 2, industrial elevator accidents, reported by various state Departments of Labor or state industrial boards, these accidents covering employees only, and Group 3, accidents to the public and employees, reported by the coroners' offices or elevator inspection departments of large cities.

These statistics have all been classified as non-shaft-door and shaft-door accidents, the latter being those which should be eliminated by the use of interlocking devices. It is shown that 73.8% of all fatal accidents would probably be eliminated by the use of well-designed interlocks.

7 How to Get Better Service with Less Natural Gas in Domestic Gas Appliances

Circular 116 of the Bureau of Standards, just issued by the Superintendent of Documents at 5¢ per copy, contains the principal conclusions from the Bureau's laboratory and field investigations on the correct use of natural gas in the home. When it is considered that it would take a million dollars' worth of artificial gas each day to replace the waste in natural gas

appliances, and, furthermore, that unless this waste is halted, it is certain that something of this sort must happen within a few years, the importance of this work can be appreciated.

Many of the natural gas stoves now in use have the burners placed too low and also use solid tops. This makes it necessary to burn a large volume of gas supplied at high pressure which has resulted in a great waste of gas and very poor service in the winter when the pressure is low. It has been shown that by removing the solid top and moving the burner close to the cooking utensil, it is possible to reduce the gas consumption to one-fourth of the present amount with greatly improved service. If a lower pressure could be used, as would be the case with the changes mentioned, leakage would be greatly reduced, and it would be easier for the gas company to maintain steadier pressure conditions.

8 Tests of Rubber Goods

Many letters are received by the Bureau concerning the testing of rubber goods of all sorts, and in order to fill what is believed to be a real want, a fourth edition of Circular No. 38 on this subject has just been issued. Its price is 20¢, and it may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

The methods of physical and chemical testing used by the Bureau are described, and an introductory portion is given up to information concerning crude rubber and manufacture of rubber goods. The materials used in the compounding of rubber are classified, the various processes of manufacture which are common to all branches of the rubber industry are described, and a brief summary is included of the essential details of manufacture of tires, inner tubes, mechanical goods, druggists sundries, etc.

Methods of physical testing are described in detail, and complete data are given of the results of experimental work which has been carried out at the Bureau. Full descriptions will also be found of the methods of chemical analysis employed, and the methods adopted by the Joint Rubber Insulation Committee for the analysis of rubber-covered wire have been incorporated.

As the method of testing fabrics used in the manufacture of rubber goods is also believed to have an important bearing on this subject, it is considered in some detail. An appendix contains a list of governmental specifications drawn up by the Bureau, a

bibliography of the papers published by the Bureau and of the more important books and periodicals that deal with rubber, and, lastly, a table of the specific gravities of the most common compounding ingredients used.

9 Precision Tests of Large Capacity Scales

The accuracy that can be obtained from large weighing scales is not generally known among engineers and others concerned in the subject.

Technologic Paper No. 199 of the Bureau of Standards outlines scientific and systematic prodecure for the accurate testing of large-capacity, compound-lever scales by a method which has been developed and used by this Bureau in connection with its work in testing railroad master scales and grain hopper scales. The plan can be adapted to the test of almost any compound-lever scale. The price of this paper is 5¢ and may be obtained from the Superintendent of Documents, Washington, D. C.

The apparatus used in the work is described, and the method of testing is explained. In the interest of a uniform and efficient method of scale testing, the scheme outlined is recommended to those who have occasion to carry out such work on large scales where accuracy of a high order is required.

10 Specification for Sole Leather

In connection with the general program of developing specifications for materials in common use, a conference was held on October 15 between the Bureau and a committee of tanners regarding the development of a specification for sole leather. It was decided, as a preliminary step, to have the Bureau submit a questionnaire on the subject to the tanning industry for the purpose of securing information on certain points. The industry is cooperating in this work through the Tanners' Council.

11 Specifications for Window Glass

On October 12, a conference was held at the Bureau of Standards at which architects, distributors, manufacturers, government departments, and others were represented. Grades, methods of grading, and specifications were discussed from various standpoints, and a number of important facts were brought out. It was made clear, among other things, that many difficulties and much unnecessary expense to consumers can be eliminated by doing away with the AA grade of window glass. It was decided to enlarge the conference by including representatives from a number of additional organizations and to start committee work upon the subdivisions of the specifications.

12 The Friction and Carrying Capacity of Ball and Roller Bearings

At the suggestion of the Navy Department, the Bureau undertook to determine the maximum safe load and the static friction under load of ball and flexible roller bearings. Tests were made on balls and rollers of different sizes and with races having different radii. The hardness of the balls, rollers, and races also varied.

The results of this work are described in Technologic Paper No. 201 of the Bureau of Standards, obtainable from the Superintendent of Documents, Washington, D. C., at 10¢ per copy. The methods of conducting the tests are described, and conclusions given which will be of value to any one interested in the design of ball and roller bearings.

13 Formation of Horological Institute of America

The need for cooperation among the watchmaking and watch-repairing industries of the countries has been previously mentioned. The National Research Council and the Bureau of Standards have been interested in this subject,and the work of the former body along these lines may be considered as having been successfully concluded with the formal organization on October 20 and 21 of the Horological Institute of America.

The purpose of the institute is to aid the jewelry industry, from the technical standpoint especially, in raising the standard of the repairmen in the trade which at present is not as good as is desired. It is planned to certify watch repairmen or so-called watchmakers into the proper one of three grades according to their qualifications. The plans that have been adopted call for a certification and examination consisting of repair work on a watch which shall then be tested by this Bureau. A member of the Bureau has been elected to the executive committee of the institute.

14 Annual Convention of the Massachusetts State Sealers' Association

The Bureau was represented at the annual convention of the Massachusetts State Sealers' Association held in Pittsfield, Mass., and an address was given on the subject of "Pending Legislation".

At this meeting specifications and tolerances for liquid-measuring devices were adopted and while based on those adopted by the national conference some changes were made. A device having a capacity of 2 1/2 gallons, allowable under the national conference specifications, was refused recognition and in the case of a few other specifications amendments were made which require changes in or additions to devices not contemplated by the national specifications. A number of problems of interest were discussed with the state and local officials.

15 Paris Technical Conference on Radio Regulation

During the past summer, delegates representing the leading nations met in Paris to consider certain technical questions concerned with radio communication and to make a report to the next International Communications Conference.

Radio communication is now regulated in accordance with the London Convention of 1912, and the revolutionary developments in radio since that time have made new regulations imperative.

The Inter-Allied Technical Committee, which sat from June 21 to August 22, considered primarily a set of 14 questions prepared by the Preliminary Communications Conference of the five principal powers which met in Washington in 1920. Two delegates of the Department of Commerce were present. One of the fundamental questions was the classification of waves. The final conclusion really adopts two wave classifications, one by types and one by classes.

The Paris Conference did not attempt to allocate particular ranges of long waves to particular countries but formulated the technical principles on which such an allocation should be considered by the next International Communications Conference. The technical principles adopted were in brief: (a) the lower frequency waves should be used for the longer distances and the higher frequency waves for the shorter distances; (b) stations situated in the same general locality and working at similar distances should in principle use adjacent frequencies; (c) each nation should use only the smallest possible number of wave lengths necessary to carry on its radio communication, and (d) use should be made of the directional properties of radio whereby the number of communications carried on in a given region may be increased by employing the same frequency a plurality of times. (This last principle was stated in an appendix to the main conclusions on question 10, but is one of the technical technical principles laid down.)

The conclusions adopted at the Paris Conference are not beinding on any of the governments; they are recommendations made by the conference to each of the five governments represented. It is assumed that they will be the basis of discussion and action at the next World Communications Conference.

A brief typewritten summary of the results of the Paris Conference has been prepared, and interested persons may secure a copy by addressing the Bureau.

16 Installation of Radio Direction Finders on Ships

An important application of the radio direction finder is to expedite the location of a wrecked ship by a rescuing ship. If the former vessel can continue to send out radio signals, a ship equipped with even a very simple type of direction finder can lay a course directly to the wreck, even in time of heavy fog. A rescuing ship not equipped with a radio direction finder may require many hours to locate a vessel in distress, even though near at hand, if there is a fog, and this delay sometimes results in a serious loss of life.

A very simple type of direction finder consists of a square wooden frame about five feet on a side, wound with eight turns (spaced one-half inch) of No. 20 insulated copper wire, and can be used with auxiliary simple receiving apparatus. This simple type of direction finder can be held in the hand by a person on deck, and fairly accurate bearings taken on a ship sending out distress signals. The working distance depends upon the sensitivity of the detector and amplifier used with the direction finder. The accuracy increases as the ship is approached. If a ship carries even a very simple direction finder of this type as emergency equipment, it may be found very valuable.

In the issue for October 1, 1921 (No. 54) of the "Radio Service Bulletin" published by the Bureau of Navigation of the Department of Commerce, there appeared a brief description prepared at the Bureau of Standards of the construction and operation of a simple type of direction finder, and an account of the delays in locating the wrecked steamship "Alaska" off the California coast in August, 1921.

More accurate bearings can be secured by radio on ships equipped with suitable permanent installations of precision types of direction finders. The Bureau of Standards and the Bureau of Lighthouses have for several years been engaged in developing the direction finder for installation on board ship, and the first-named institution has recently prepared specifications for a type of direction finder which is suitable for this purpose. Copies of these specifications are available for distribution to manufacturers, who intend to make the device for sale, or to shipping companies desiring to use it.

17 Total Radiation from Stars

During the present month, a representative of the Bureau spent some time at the Lowell Observatory, Flagstaff, Arizona, making new measurements of the total radiation from stars. The spectral energy

distribution for 16 stars was also determined by means of transmission screens thus obtaining for the first time some complete knowledge of the radiation intensities in the complete spectrum of a star.

The results obtained verify previous observations made 7 years ago showing that the red stars emit 2 1/2 to 3 times as much total radiation as blue stars of the same visual magnitude. The spectral radiation measurements indicate an energy distribution similar to that of a black body at 3000°C for red stars and 9000 to 10 000°C for blue stars.

18 Head and Eye Safety Code

In Bulletin No. 46, there was mentioned the preliminary work which had been done in connection with the code for the protection of the heads and eyes of industrial workers. Since the first edition of this code was issued, certain revisions have been found desirable, and these will probably be incorporated in a second edition to be published as soon as possible.

The contemplated changes are minor ones which will make the specifications for goggles, welding helmets, and other protectors meet more exactly the needs of industrial workers. In this matter the Bureau of Standards is having the cooperation of a sectional committee organized under the rules of the American Engineering Standards Committee, and this sectional committee held its first meeting on September 30.

19 Safety Code for Logging Operations

The National Safety Code for Logging and Saw Mill Operations, which has been in preparation by the Bureau for two years, is nearing completion. Final draft is being revised with the assistance of a sectional committee organized according to the practice of the American Engineering Standards Committee. This sectional committee held a meeting in Boston on September 30 at which a number of debatable points were considered.

Respectfully,

S. W. STRATTON

Director

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